

# USFS VLAT Report Summary

A Brief Look at:

- What We Did
- Who Took Part
- What We Concluded

# Current Generation “Large” Tankers



# VLAT - Class



# VLAT OT&E Project Objectives

1. Verify the **airworthiness** of the DC-10/B-747 aircraft with the Aerial Retardant Delivery mission environment and flight profiles.
2. Determine the **mission compatibility** of the DC-10/B-747 aircraft with the Aerial Retardant Delivery mission environment and flight profiles.
3. Develop **recommended operational usage regimes, policies, and procedures** for incorporation by USFS and DOI.

# VLAT Assessment & Recommendation Options

- Possible options for phasing the desired assessment within current schedule and resource limitations.
- Recommendations matched to assessment level.
- #1 & #2 include recommendations for further testing.

- Combined with the below, provides the most robust assessment & recommendation package.
- Data from operational flights conducted under recommended restrictions based on below phases could support follow-on flight test work.

- Could be conducted concurrent with operations under restrictive “existing data” recommendation.
- Could be used to update/expand recommended usage envelope

- Least time & cost.
- Most general & restrictive recommendation.

## 3. Flight Tests (operational &/or dedicated)

## 2. Flight Simulation Assessment

## 1. Existing Data Assessment

# Simulator / Flight Summary

- Three half-day periods in KC/DC-10 simulators
  - 5 total pilots, 3 NASA, 2 contractor
- Four half-day periods in the Ames 747 simulator
  - 7 total pilots, 3 NASA, 4 contractor
- Two sorties each in DC-10 and Kingair Lead Plane over moderate hills in desert terrain northeast of Victorville, CA
  - 3 NASA pilots and 3 engineers (all observers)

# Report Generation Team

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# Conclusions and Recommendations



# AIRWORTHINESS

- Both aircraft were judged to be airworthy in the configurations under a limited evaluation. FAA certification requirements in Parts 25 and 26 appear sufficiently rigorous to ensure basic airworthiness.
- Long term fatigue-related structural life remains an area in need of further study, but the test team concluded that the ongoing USFS continuing airworthiness program should enable adequate monitoring of fatigue life issues.
- These assessments were made based on review of STC and retardant delivery system documentation, as well as limited inspections performed on the DC-10 airframe and retardant delivery systems.

# MISSION COMPATIBILITY

- VLAT aircraft appear to be compatible with the wildland fire suppression mission, provided that they are used to supplement other aerial retardant delivery platforms rather than replace them in all environments.
- Steep or rugged terrain, reduced visibility due to smoke and ash, and situations where fire behavior is erratic will affect VLATs to a larger degree than they affect the current generation of aerial tankers. These situations may preclude effective use of VLATs for certain classes of fires, particularly those with small or irregularly shaped delivery zones.
- Extremely rugged terrain will make setting up for stabilized deliveries challenging, particularly where the pilot must judge wingtip terrain clearance while maneuvering over irregular terrain for setup.
- These conclusions are based on pilot comments generated during multiple simulated deliveries using high-fidelity visual simulators over various terrain types. Dispatch decisions will need to take these and other factors into account.

# Mission Compatibility Details

Mission Factor	Compatibility			Remarks or Employment Considerations
	none	partial	full	
Required Infrastructure		X		May need added ramp area and specialized servicing equipment
Deployability		X		See above
Lead Plane Rqmnts		X		Specially trained lead pilots will be needed during initial ramp-up
Range/Endurance			X	
Airspace Usage		X		May need special handling to avoid wake turbulence issues for others
Terrain/Density Alt			X	
Delivery Speeds			X	At top end of desired range
Accuracy			X	When used in appropriate scenarios
Coverage Levels			X	
Reserve Performance			X	Excellent

# USAGE RECOMMENDATIONS

- Our analysis suggests that for level or gently rolling terrain where level to slight descents ( $< 6-7\%$ ) are required, VLAT-class aircraft could probably be employed with few restrictions as long as they remained above 300' AGL during the delivery.
- Power margins for this class of aircraft, even considering the possibility of single engine failure during delivery, may actually permit climbing deliveries over very gradual slopes of less than 3 – 4 % grade, provided suitable egress options are available.
- Usage in very steep or rugged terrain is not recommended unless deliveries can be performed with minimal maneuvering, a lead plane is available, and adequate terrain clearance is available at the wingtips as well as on centerline.
- Until significant experience is gained on VLAT platforms, at least 400' – 500' terrain clearance should be maintained in rugged terrain, and a climb must be initiated before any turns of greater than 10 degrees bank angle.
- On-board systems like auto-throttles and combined use of both radar and barometric altitude alerts could reduce pilot workload as well as provide improved situational awareness.
- These recommendations are based on pilot comments generated during multiple simulated deliveries using high-fidelity visual simulators over various terrain types, as well as on direct observation of experienced aerial firefighting crews performing both airborne and simulator retardant delivery runs.